Information and Communication Technology in Indian Healthcare Sector

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Abstract- India is the vast developing country in the world with nearly a fifth of the world's population. According to the United Nations in July 2016, the population stood at 1,326,801,576. Its socio-economic attributes reflected in its medical system. There are more than 70% peoples lived in rural area where proper medical facilities is not available because the insufficient medical professionals or doctors that are practicing there and on-going needs to update their knowledge. Qualified doctors' practice widely diverges from standards of care due to lack of formal qualifications

I. INTRODUCTION

India is the vast developing country in the world with nearly a fifth of the world's population. According to the United Nations in July 2016, the population stood at 1,326,801,576. Its socio-economic attributes reflected in its medical system. There are more than 70% peoples lived in rural area where proper medical facilities is not available because the insufficient medical professionals or doctors that are practicing there and on-going needs to update their knowledge. Qualified doctors' practice widely diverges from standards of care due to lack of formal qualifications

In the last two decades, there has been a growing concern over the performance of the healthcare delivery system in India. In the year 2012, a mere 1.3% of the GDP was allocated to public health. As per the Government of India's National Rural Health Mission Document, only 10% of Indians have some form of health insurance and mostly this is inadequate. The healthcare delivery system, in its present state, is unable to deliver and meet the health goals of India.

Information and communication technologies have conducted number of innovations and developments in various fields. In this perspective, e-Health has been a front line development in healthcare sector. It refers to electronic systems developed for management and organisation of medical resources. The deployment of e-Health systems has made healthcare delivery fast, approachable and affordable for remote patients. This has increased significance of e-Health Systems in terms of decision making processes about individuals' health.

Definition published by e-Health researcher Gunther Eysenbach in the article what is e-health? is among the most frequently cited and reads:

"e-Health is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies."

Hence, this paper presents the literature review on e-Health system has been conducted to identify its role and status in India. Here the main focusto study the nature of the work, its financing, and the challenges and the potential of ICT and its implementation in health care system in India.

II. CURRENT E-HEALTH SCENARIO IN INDIA

The Indian health care services are highly skewed in favour of urban populationwhich is 28% of Indian population. Nearly one million Indians die every year dueto inadequate healthcare facilities and 700 million people have no access tospecialist care and 80% of specialists live in urban areas .There has been undue delay in implementing e-governance and e-healthcare inIndia due to following reasons:

- Absence of competition in health sector for long time healthcare is handled by Public Health System (PHS) with no competition.
- Weak customer with low bargaining power.
- Non-existence of funding system like insurance or social security agency.
- Strong professional culture among doctors hostile to new ICT applications.
- Doctors and nurses believe on their skill than on computer.
- Lack of computer-aid in medical and nursing education.

The National Health Policy endorsed by the Parliament of India in 1983 and updated in 2002 encourage the introduction of electronic communication media in health sector.The government of India has launched "National Rural Health Mission" aiming at equity in best health care to this target group. The Ministry of Health & Family Welfare and the Ministry of Communication and Information Technology (ICT) are jointly creating a national health information infrastructure, for easy captureand dissemination of health information. There are more than 165 telemedicine platforms supported by the Indian Space Research Organization (ISRO) and 76 by Communication and IT Ministry. The Ministry of Health had formed "Telemedicine Task Force" to address many issues relating to e-health technology based healthcare which will facilitate in forming a framework for e-health application for the country. The union government also recognizes ICT as the most efficient enabling tool for achieving the said goals. This is having the desired trickle-down effect and several state governments have earnestly taken up e-Health monitoring and reporting systems for their public health programmes. Disease surveillance systems under IDSP in Andhra Pradesh and Tamil Nadu, and ICDS surveillance system in Orissa are some examples of such initiatives. Public-private partnership has been successfully used to achieve a convergence of technical resources and personnel in the e-Health sector, for such projects. Funding and technical assistance has also been received from several external agencies such as the World Bank and WHO.

III. e-HEALTH AND TELEMEDICINE INITIATIVES IN INDIA

Evidence based clinical practice needs sufficient knowledge on latest development in medical science. Automated information management tools like internet, web based libraries, Electronic Medical Record (EMR), Electronic Health records (EHR), and computerized prescriptions are important components. Computerization of hospitals Quality Assurance (QA) by Total Quality Management (TQM), medical and nursing audits supported by computerization of all processes like store, pharmacy, finance and purchase section, inventory and administrative machinery would save money, time and transcend human error. Computer help should be utilized for clinical decision making for selecting suitable tests, proper interpretation, and accuracy in diagnosis and updatemanagement. Though computer can't be substitute for human brain, it is definitely useful as a neutral platform for unbiased analysis to assist the physician against commission of error. Computer is highly useful for medical and nursing teaching, evaluation of entrance tests and various competitions for awards and certifications to eliminate human bias and error .

IV. RESEARCH FINDINGS AND DISCUSSIONS

After humanizing the available literature, nineteen studies were found relevant to contribute in current review context. The list of solutions, their names, services and deployed locations are given in the Table 1. The results of literature review presented a set of studies aimed to reveal the presence of different e-Health systems and their services for serving patients and medical professionals of the country 2-12. Moreover, the review also shows the importance of e-Health solutions in terms of diagnosis, consultancy, managing health affairs and patients of remote areas. The analysis of Table 1 provides motivation for performing further analysis to identify the gaps in previous work and to suggest some areas for future research work. For this purpose, studies selected for current review have been divided into different categories such as Remote Consultancy; Training and Learning; Hospital and Record Management; Challenges and Opportunities,

to analyze the current status of e-health services in India

Table 1: e-Health Care system developed in India

S.No.	System		Organization	Nature and services	Location
	E-Clinic	E-Health Systems Developed for Remote Medical Consultancy	Naandi Foundation	Provides medical consultancy and services to cancer patients	Malwa, Punjab.
	Child Health Monitoring System		Intel	This system provides check-up facilities to needy urban children.	ChandaniChowk, New Delhi
	Health NET		21 Century	Provides good quality health care services to all segments of society especially to poor's in remote areas.	Goa
	HealthCare Solution.		Hewlett Packard (HP)	System deals with the management of patients.	Maharashtra
	Hello Doctor 24*7		MKCG Medical College, Orissa	Provide healthcare information to rural public in form of teleconsultation.	Orissa
	School Health Monitoring System.		Tata Consultancy Services and Inte	Provides health education and learning to teachers and students of the school.	St. Philomena Girls Higher School, Trivandrum
	Virtual Medical Kiosk		E Health Access Pvt. Ltd	It will provide secure environment for interaction between doctors and patients for medical consultancy.	Hyderabad and Andhra Pradesh,
	Telemedicine		Government of India, Apollo Telemedicine Networking Foundation (ATNF)	Doctors can share expert knowledge required during treatment. Sharing of medical tools or equipments is provided by this solution. It also provides training to health workers or staff located in distant areas.	Uttaranchal, Uttar Pradesh, Orissa and Karnataka
	Neonatology		All India Institute of edical Sciences (AIIMS).	Provides time critical information regarding newborn care to healthcare professionals	Global
	Hospital Information System (HIS	E-Health Systems for Hospital and Record Management	Wipro	System provides different services related to hospital and record management such as patients' registration, digitalization of patients records.	Six hospitals of Delhi Municipal Corporation.
	REFID-TIRM (Individual Tracking and Record Management System)		IEEE	Maintains the history of infants and vaccination.	Ahemdabad

	India HealthCare Projects		CMC Ltd.	It provides the facility of data compilation and report generation.	Andhra Pradesh
	Electronic Medical Record (EMR)		Tata Consultancy Services and Intel	Collect and saves medical records of patients. Provides medical history of patients	Tamil Nadu
E-Health Systems for Training and Learning					
	Newborn Care		World Health Organization (WHO) and All India Institute of Medical Sciences (AIIMS)	It provides e-Learning's facilities to health workers or professionals.	Global
	DVDMS (LMIS) Drugs & Vaccine Distribution Management system	e-health initiatives through Indian government	Indian Government	Drug Procurement & Inventory Control System (DPICS) is live and working in all Districts Hospitals across UP, will be scaled up to PHC level. UP will migrate to DVDMS, which provides end to end supply chain management	Uttar Pradesh
	E-Olakh		GujratGovernment	This ICT initiative is developed for recording birth registration, death registration, still birth registration, compilation of records. The main aim is maintaining database of Birth & Death records and Issuing birth & death certificates.	Gujrat
	E-Mamta (MCTS		Gujrat Government	A Comprehensive web portal having inbuilt facility for filling form F online and data analysis, which will help to locate wrong doers, thereby strict implementation of act is ensured.	Gujrat
	GPS based MHU / MMU Tracking System:		Gujrat Government	This system is for tracking and monitoring of vehicles which provide health services to unreached areas. It tracks the Vehicles provided to Health care providers.	Gujrat
	Asha Soft		Tamil nadu	To capture beneficiary wise details of services given by ASHA to the community.Online payment of ASHA to their bank accounts.Generate various reports to monitor the progress of the program	Tamil Nadu
	eVaidya – Telemedicine Project Pilot In Urban		Andhra Pradesh Government	There are Urban Health centers in Vijayawada and Visakhapatnam on pilot to eVaidya, a tele, ePHC concept. 60-70 patients are being catered to at these	Andhra Pradesh

	Health Centers (PPP)			centres. Various diagnostic tests are also being conducted at these centres with manpower being provided by the PPP Partner.	

IV. CHALLENGES OF E-HEALTH SYSTEMS

India faces a number of challenges in the development of effective e-Health solutions like the inertia of traditional agendas, and ways of doing things. Divisions between health-professions, the public-private sectors, facilities, levels of government and cultural communities generally mitigate against large national inter-jurisdictional projects in the public sector, and new large-scale investments in the health sector. The technologies themselves, as well as their deployment, are challenging matters.

There are questions about how to properly automate the health-system, which technical standards are to be adopted, Is the current level of technology and technological sophistication of the providers and public sufficient to the task. Here are some most challenging issues in e-Health projects:

- Security, privacy, and confidentiality: These are major concerns in e-Health solution due to its significance. Insufficient accessing ratio is another challenge, which comes in the way of e-Health Systems.
- Illiteracy of patients :Users especially patients are not well aware regarding e-Health Systems Illiteracy of patients is another important obstruct in the case of Indian e-Health Systems.
- Internet connectivity: Unavailability of internet connectivity in rural and remote areas .
- Infrastructure: Lack of supportive infrastructure (like high band width special equipment), funds, basic knowledge of computer among health workers, uniformity in clinical protocols, training for health care professional, patients knowledge about technology, employment of appropriate technology, quality control mechanism integration between systems and organizations.
- Finance: High cost of deployment, fears to technology failure usability issues and changing the mind set of users such as patients and medical professional regarding e-Health Systems also impacted the success rate of e-Health.
- Cultural issues: Implementation of 36 different official languages, serving large population and area are challenging issues of e-Health in India

V. OPPORTUNITIES IN E-HEALTH SYSTEMS

Opportunities Increases health awareness of the general public, utilization of new technologies, availability of remote health professionals, availability of staff exchange programme, collaboration and international exchange of experience.

- ICT provides new careers requiring professional skill for delivering information and communication technology literacy.
- Delivers enhanced medical services in the remote areas.
- Reduces hospitalization rate, waiting time, travel cost of patients. It also saves time and money of doctors and patients.
- Provides facility of e-Learning for professional development.
- Provides the facility of generating medical history of patients and patient-doctor communication.
- Addressing the ignored diseases of different countries.
- Improves patient treatment and follow-ups, healthcare assistance to remote location, diagnosis from primary care, patient's satisfaction and quality of life.

CONCLUSION

ICT can support improvements in the quality of health care by helping to increase the qualifications and skills of health and medical professionals and thereby improve the delivery of health services. However, access to information may not be sufficient in and of itself. Health professionals need to gain an

understanding of how to evaluate, interpret, and apply this information to their specific practice.

This paper highlighted some findings based on review of literature in context of e-Health. Out of the various findings, the main finding is that e-Health has a potential for healthcare sector. In addition to this, e-Health systems are emerging as an important tool in different fields of healthcare with the aim of enhancing communal health. The presence of different studies related to e-Health systems, challenges and opportunities have found in this literature review.

Hence, this paper contributes literature by 1. Providing review study on e-Health Systems developed for Indian healthcare sector, 2. Underlining the studies about services, challenges and opportunities of e-Health, and provides some gaps and direction for future work in the field of e-Health. This paper can be treated as a pedestal to provide a preliminary study for researchers interested in conducting studies on Indian e-Health Systems and wants to improve current systems. Thus, the study will save the time and efforts of other researcher by providing information related to existing e-Health Systems and gaps to assist them in future work.

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